

March 19, 2012

Comments on the Draft Chemical Fate and Transport Modeling Study, San Jacinto River Waste Pits Superfund Site (February 2012)

On behalf of the Port of Houston Authority (PHA), HDR has reviewed the Draft Chemical Fate and Transport Modeling Study and submits the following comments.

Section	Page	Line	Comment
Figure 1-1		General	Study domain is not delineated in Figure 1-1.
1.2	3	Top	Armor cap layer is shown in Figure 1-2. This figure is missing.
1.2	3	Top	State when the 3 areas of the TCRA were capped.
1.2	3	2,8	Figure 1-2 was not found in Figures section
1.3	3	Bottom	Footnote states that data gaps existed but did not limit the analysis. Does this statement belong in the Study Objectives section? This statement is not substantiated; it would belong in a section that addresses data gaps, e.g., sensitivity analysis.
2.1	7	General	Vessel (tugs, barges) wake, prop scour, and wind-generated waves were not included as potential hydrodynamic forces affecting sediment transport. It is understood that some of these factors are very difficult to take into account in long term numerical modeling such as prop scour. However, how does omission of these factors affect the overall accuracy of the sedimentation modeling?
2.2.2	8	Bottom	Particles in the model are separated into four discrete size classes. However bed properties (page 25) are separated into three types that include more than one size class. Clarify whether or not the model state variables for particles are the same for the water column and the bed.
2.2.2	8	Last	The study states, "The sediment transport model has the following characteristics and capabilities: 1) two- or three-dimensional transport of suspended sediment in the water column;" However hydrodynamic model is 2-D. How can a 2-D model simulate 3-D sediment transport?



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2.2.2	9	5	"...transport and fate of organic solids is not simulated by the model". This is a concern because dioxin/furans are sorbed to organic carbon. TSS data used to estimate boundary conditions include organic solids but report does not address a quantitative adjustment in setting boundary conditions (page 31). In addition, model-computed TSS concentrations are compared to TSS measurements that include organic solids. These issues should be addressed here or refer to sections where they are addressed.
2.2.2	9	Foot Note 3	Please clarify footnote. Marine traffic (other than the San Jacinto River Fleet) including dredges and barges have had operations in this area prior 2011.
2.2.3	9	Last	Model simulates DOC in certain cases. Be specific - define which cases.
2.3	11	4	Depth average hydrodynamic model is a valid approximation for non-stratified flow. Lack of stratification should be substantiated with field data, e.g., temperature and salinity measurement profiles over water depth.
Figure 3-2			Shoreline is noted as white rectangle in legend; it would be better to note as a line. White boxes extending upstream of tidal and subtidal boxes appear to be non-tidal; if so, change legend to non-tidal.
3.1	14	Foot Note 7	Please clarify footnote. Why is the HSC (at least some portion of it) not included as an area that can be modeled for contaminant fate? What if during a model event, the results suggest that contaminants were transported beyond the relevant area for model predictions? Is there evidence that suggests this is not a likely situation?
3.1	14	Foot Note	"...sediment transport and chemical fate predictions are not relevant to this portion of the HSC". This appears to mean that the model is not applicable to the HSC as there are no field data from the HSC used in the calibrations. However, this raises concern that the model is not properly simulating the advective and dispersive transport of sediment and contaminants between the HSC and the SJR. Further explanation of "relevant" is needed.

Section	Page	Line	Comment
3.2	14	6	Possible typo "13 transects downstream" instead of 12
3.3.1	17	15	Possible typo 27% instead of 37%
3.3.1	18	Bottom	Maximum flow of 356,000 cfs at Sheldon, TX is stated. Where is this located? Is this the maximum daily or instantaneous flow for the period of record? What is the period of record?
3.3.3	20	16	Morgan's Point verified WSE data are available from 1996 to present. It appears that predicted WSE were used in model from 1990-1996. Please clarify.
3.3.3	20	19	Was unable to find full citation for Berger et al. 1995 in references
3.3.3	20	Bottom	Salinity has minimal variation in the system. Yet <u>average</u> salinity at Morgan Point is 10 to 20 ppt and salinity at Lake Houston is zero. A difference of more than 20 ppt between downstream and upstream model boundaries does not seem to be minimal. Clarify. Salinity affects flocculation and settling of cohesive sediment; however, this mechanism does not appear to be expressed in the underlying equations. How is this accounted for?
3.4	21	3	During the 2010 data collection period, the report stated inflow to the Lake Houston dam ranged from 0 to 21,000 CFS. Please clarify. What was the maximum discharge flow rate during this period?
3.4	21	5	ADCP data during May 10 - July 13, 2011 were chosen for the model calibration as the best available information. Why wasn't ADCP data for the remaining 2011 survey used for comparisons?
3.4	21	Bottom	Depth average velocity at high flow is simulated with good accuracy. However, model underestimates E-W velocity component by about 50% of measured component. Is this difference considered good accuracy?

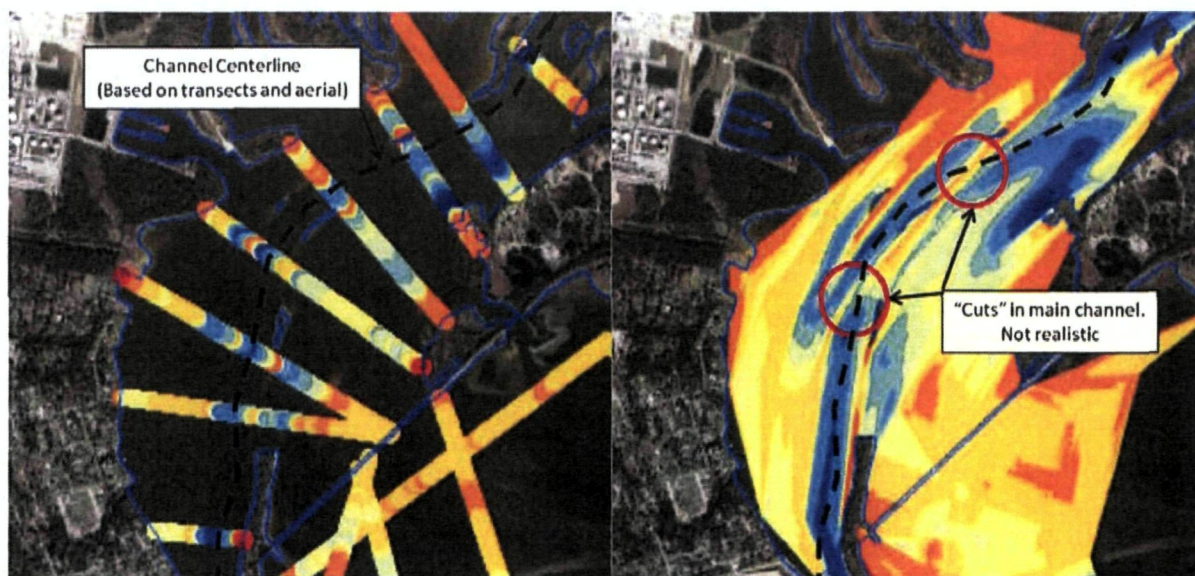
Section	Page	Line	Comment
3.4	General	General	The most extreme subsidence in Houston area occurred in the near vicinity of the Site. Although it has been documented that subsidence has lessened since 1990 in this area, it may play an important role in the 21 year modeling exercise. It appears subsidence was not taken into account in the model. Was subsidence a consideration for model setup? If so, what is the anticipated affect on omission of subsidence on the model results and accuracy?
Figure 3-14		General	The north-south velocity does match up well, however, the east-west appears to be consistently underestimating the measured data by around 50%. Magnitude of measured velocity of both current directions (N-S, E-W) is relatively the same. Is the cause of the underestimation known?
4.2.2	25	Last	Two criteria for cohesive sediment bed type are median particle diameter less than 250 um, and clay and silt fraction greater than 15%. This appears to be overly inclusive of sand particles in this bed type. Explain why these criteria were not more limiting to fine particles.
4.2.2	26	Top	Channel of SJR downstream of Lake Houston was assumed to be hard bottom. Does the hard bottom channel extend into the sediment sampling area shown in Figure 4-1? Clarify.
4.2.2	26	Foot Note	HSC bottom was assumed to be hard bottom because modelers assumed this does not affect the site. However, deposition and resuspension of sediment in the HSC may be important to sediment and contaminant transport in the SJR. As the deposition and scour of sediment in the HSC is relevant to the Port of Houston Authority, the model should accurately simulate sediment and contaminant transport in the HSC.
4.2.2	27	Top	The premise for normalizing bed shear stress to set median particle diameters for cohesive type bed cells should be explained. For example, why is a large range in bed shear stress desirable for this analysis? This is not covered in Appendix G.

Section	Page	Line	Comment
4.2.2	28	Bottom	Bed erosion parameters were assumed to be constant throughout the horizontal plane of each sediment layer as sediment flume test data did not indicate a pattern. The potential effect of this assumption was addressed by a sensitivity analysis. However, the sensitivity analysis varied erosion parameters uniformly throughout the model; it did not change the erosion parameters within the area of interest for potential remediation (i.e., EPA Preliminary Perimeter).
4.2.3	30	Bottom	Refers to equation 4-5 as log-linear; however, it is a log-log relationship.
4.2.3	31	Top	Assigned 100% of incoming sediment load at Lake Houston as Class 1 (clay & silt). What is the source of the sand on the bed of the SJR?
4.2.3	31	Bottom	Downstream tidal boundary and HSC boundary sediment concentrations were set to 25 mg/l. What size class is assigned?
4.2.3	33	Top	Over-prediction of NSR at station SJR001 and SJR002 is stated to be a factor of 2. Model-predicted NSRs are shown as ranges in Figure 4-19. The over-prediction factor at SJR001 is calculated by this reviewer to be between 2.7 and 33, which is greater than a factor of 2.
4.2.3	33	Top	Under-prediction of NSR at stations SJR004, SJR005 and 006 is stated without providing any factor. The factors are calculated by this reviewer as less than or equal to 0.2, 0.33 and 0.15, respectively.
4.2.3	33	Top	"...model predicts net sedimentation with reasonable accuracy." Does the over- and under-prediction at five of the eight stations referred to in the previous 2 comments qualify as reasonable accuracy?
4.2.3	33	Top	"... is consistent with known characteristics of the Study Area." Provide details and references to support the known characteristics of the study area.
Figure 4-22			Cumulative frequency plot comparison of model and empirically estimated net bed change in cohesive neglects the specific location of the sediment cores analyzed. Sediment areas of high contaminant concentrations are most important for site-specific graphical comparison.

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Figures 4-24 and 4-25			Cumulative frequency plots of TSS neglect the timing of the sampling and may fail to show a systematic error. Time series plots for the 2 sampling locations are needed to compare the model and observed TSS data.
Figures 4-23, 4-26 and 4-27			Figures show schematically model average sediment mass transport results on a model-area-wide basis. However, remedial alternatives will focus on specific highly contaminated areas. Sediment mass transport within and adjacent to the EPA Preliminary Perimeter should also be shown schematically.
Figure 5-4			Red triangle in legend is labeled as "Upstream Inflow Boundary". However, the 2 red triangle locations on the map are not at the model's upstream boundary. Correct figure.
5.3.1	62	Bottom	Water column concentrations at the upstream boundary were adjusted by a factor of 1.5 to 3. These factors would increase concentrations but the text states that a downward adjustment was done. Clarify and provide details for each of the three contaminants.
5.3.1	63	Bottom	Text in parenthesis states that Koc of OCDD is higher than TCDD and TCDF ...and it contributes to the mass of dioxins and furans in many soil and sediment samples. This statement appears to contradict itself.
5.3.2	64	Top	Years when sampling data were collected (2002-04 and 2009) were not used to define the model simulation period (2005-10). This is an inconsistency. Model results for select years should be compared to data instead of using the entire simulation period. As TCDD and TCDF concentrations are shown to vary with flow (page 67), time-specific comparisons are needed.
5.3.2	64	Bottom	"...model results ... were averaged laterally." Were water samples collected at multiple locations on transects or at a single location. If it's the former, describe the lateral variation. If it's the latter, model results at a single model cell should be compared to the sampling data.
Figure 5-19 a, b, c			Sampling data should be included in the plot with model results at appropriate locations.

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5.3.2	64	Bottom	Model and ranges (presumably min and max) are shown in Figures 5-18 a, b and c; however, vertical bars show 2 standard error around mean of sampling data. Why not use consistent metrics for model and data?
5.3.2	65	Bottom	TMDL and 2009 TCEQ stations are approximately 0.25 mile apart from each other. Text states that the model captures this <u>lateral</u> variation in water concentration; however, results were averaged laterally. Should this be <u>longitudinal</u> variation?
5.3.2.1.3	68	All	Model over-predicts particulate concentration and under predicts dissolved concentration of contaminants. What is the implication of the dissolved concentration difference on estimating the biota levels?
5.3.2.2	69	Bottom	Model predicted surficial sediment concentration reduction is a factor of 0.5; however, data show a reduction factor to 0.2 of initial concentration. This is a big difference when it comes to monitoring the natural recovery of the river. The baseline condition of natural recovery appears to be more favorable in reality than the model indicates.
Figure 5-21 a, b, c			COPC Area should be defined in text and figures. There are numbers of samples that are greater than the max value shown on the a and b plots but not on c.
5.3.2.2	70	All	Model's top layer is 6 inches thick. Were the sediment samples representative of the top 6 inches or was the sediment grab narrower at the bottom than the top? Differences could help explain an higher reduction in the field data than the model.
5.3.2.2	70	15	"Although predicted decline .. not as large..., they are within a factor of 2..." Correction: a factor of 2.5.
5.3.3	71	All	Contaminant model sensitivity was done separately for 4 parameters rather than jointly for combinations of parameters as was done for the sediment transport model. While the model results showed little variation to individual parameters, combinations of parameters may produce greater variations.

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6.1	79	17	" at small spatial scales uncertainty in model's predictive capability increases..." Highly contaminated areas (e.g., EPA's Preliminary Perimeter) are the focus of the study. Uncertainty in this area should be described by focusing sensitivity analyses.
6.1	81	Top	"...model predicted decline in surface sediment concentration..., consistent with data-based evaluation" Differences (as stated above) are a factor of 2.5 and as such do not appear to support the claim of consistency.
6.2	81	Bottom	Model will be used for a baseline evaluation of the TCRA. Briefly describe how model will be modified to reflect the stone capping. Will additional bed sediment types be needed? Which model parameters will undergo the greatest change? Has the model been used for similar situations previously?
Appendix A	Figure A-3	General	Upstream bathymetric interpolation cuts main channel twice near Grennel Slough. This is may affect upstream flow conditions. This can also be seen in Figure 3-5.



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Appendix A	2	Top	Bathymetric survey did not cover area within EPA's Preliminary Site Perimeter (see Figure A-1). This appears to be a significant gap in the bathymetry data needed for the model. Explain why data within this area was not obtained and describe the data used to set the depths of model cells in this area.
Appendix B	2	Top	ADCP measurements were conducted May 10 through November 15, 2011. However, Figures B-1 through B-3 show data for May and June only. Plot the remaining velocity data and present plots.
Appendix B	2	Bottom	ADCP data were not obtained at high flows because such flows did not occur in 2011. Would the study team conduct ADCP measurements at high flow if such flows occur soon?
Appendix D	2	Top	2 high flow sampling surveys were planned but not conducted because such flows did not occur in 2011. Would the study team conduct TSS measurements at high flow if such flows occur soon?
Appendix E	2	Top	Erosion rates were measured using the Sedflume apparatus. Describe the procedure for measuring gross erosion rates (e.g., spatial and temporal scales) and include a graphic that shows the Sedflume dimensions and parts.
Appendix F	5	Bottom	"...effects of uncertainty due to selection of data to use in the log-linear regression were also accounted for in the analysis." Explain how this was done. Was it a statistical procedure? If so, provide quantitative results.
Appendix F	7	Table F-3	Upper and lower bound estimates of NSR are estimated based on slope of ^{210}Pb vs. depth in sediment cores. Provide the r-square for the regression lines of the slopes for the upper and lower bounds.
Appendix F		Figure F-27	Map of NSR indicates that net sedimentation rates are higher north of the highway I-10 bridge than south of it. Do the modelers observe a similar pattern or not? Comment on any pattern.

Any questions concerning these comments should be communicated to Linda Henry, Port of Houston Authority.

Sincerely,



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Cc: Kerri Snyder, AICP, Project Manager